

# What's my sonde telling me and what's new?

## TCEQ SWQM Worshshop

October 29, 2014



If sondes could talk...



## Tell Me:

- ☒ There is a problem and it is “X”
- ☒ It's time to calibrate the sensor
- ☒ Maintenance is due

**Ultimately: you can trust your data!**

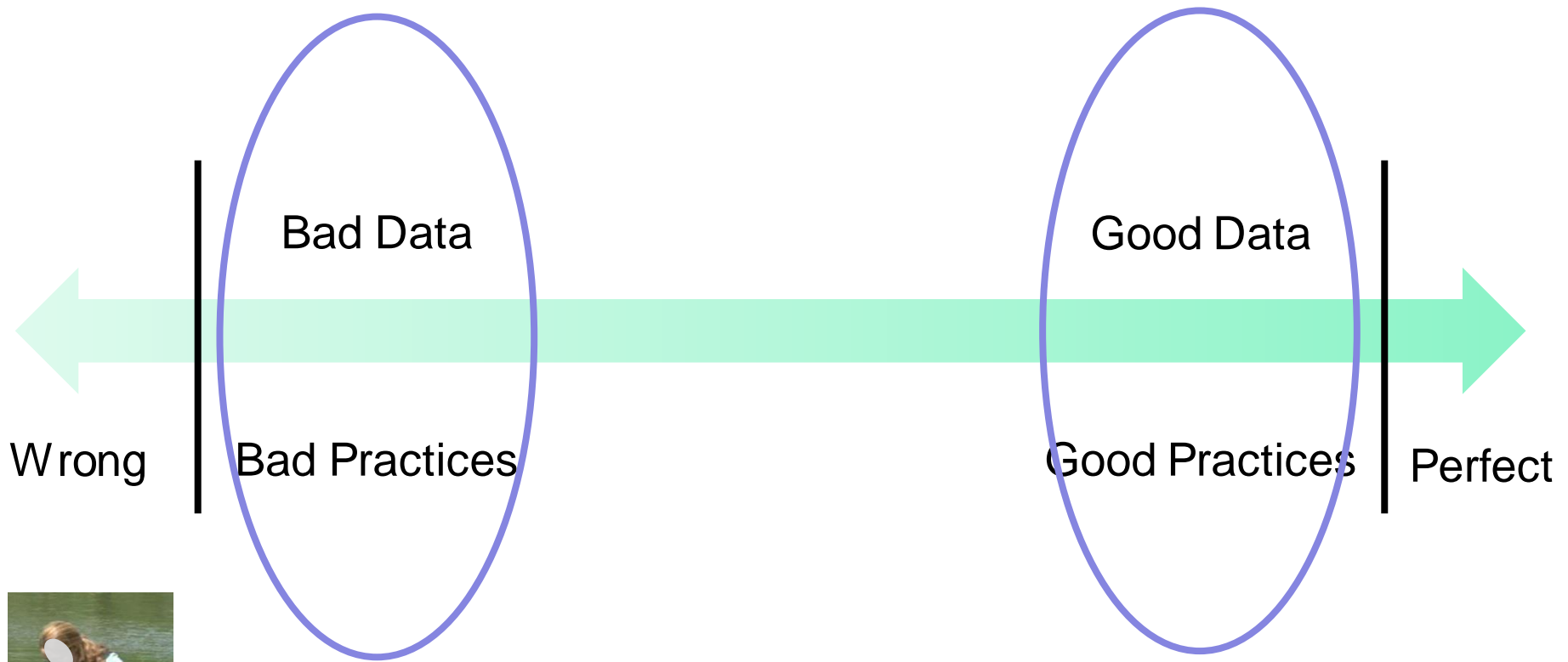
# Good Data Continuum



**There is uncertainty in (almost) every measurement**

# Best Practices Continuum

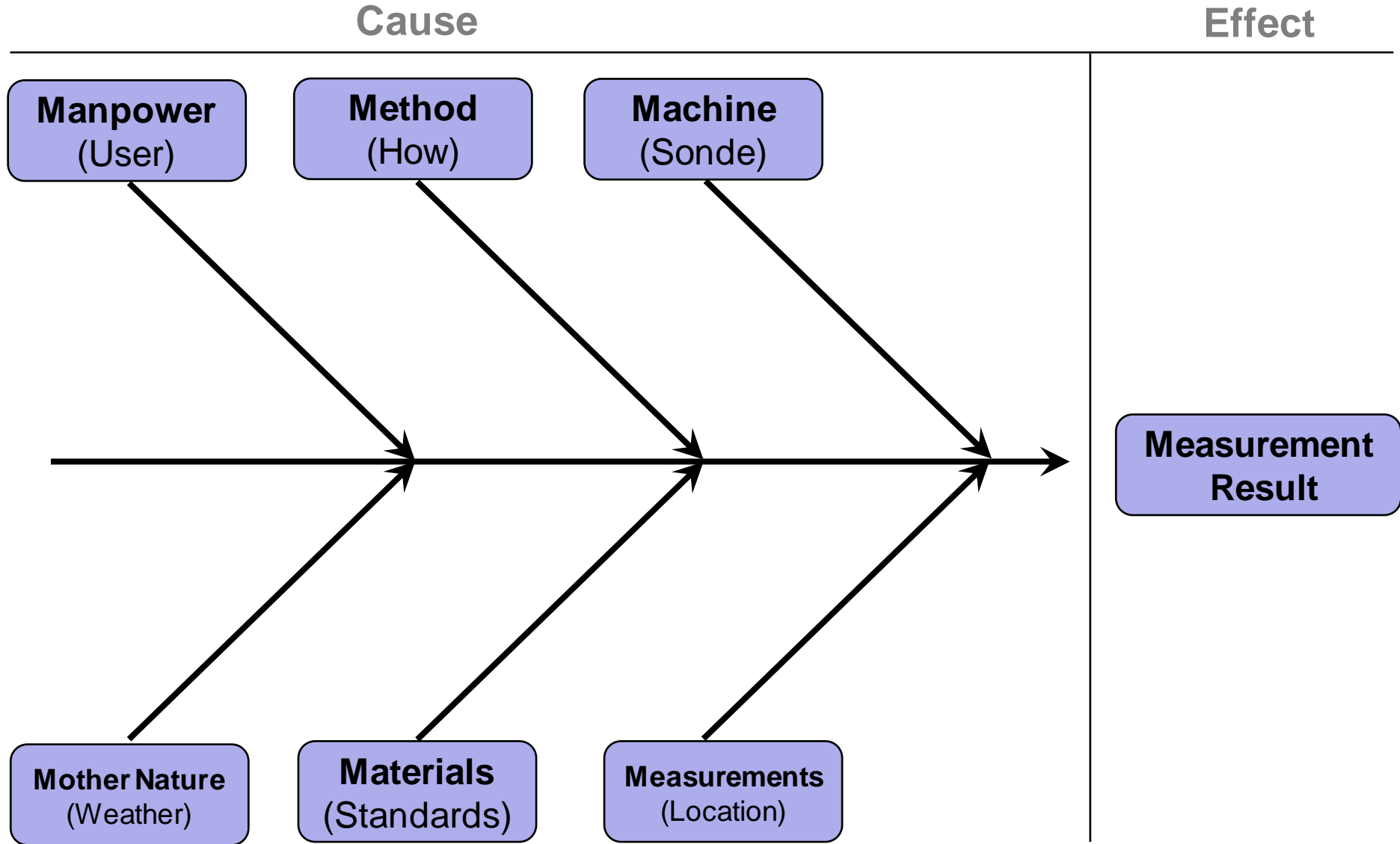




# The “True Value” What is Real?

- Methods of determining true value:
  - grab samples that are evaluated using a trusted laboratory technique
  - instruments that are serviced and calibrated solely for quality control
  - calibration standards
- Compare measurement result to something you trust!

# Variability: Identify and Minimize

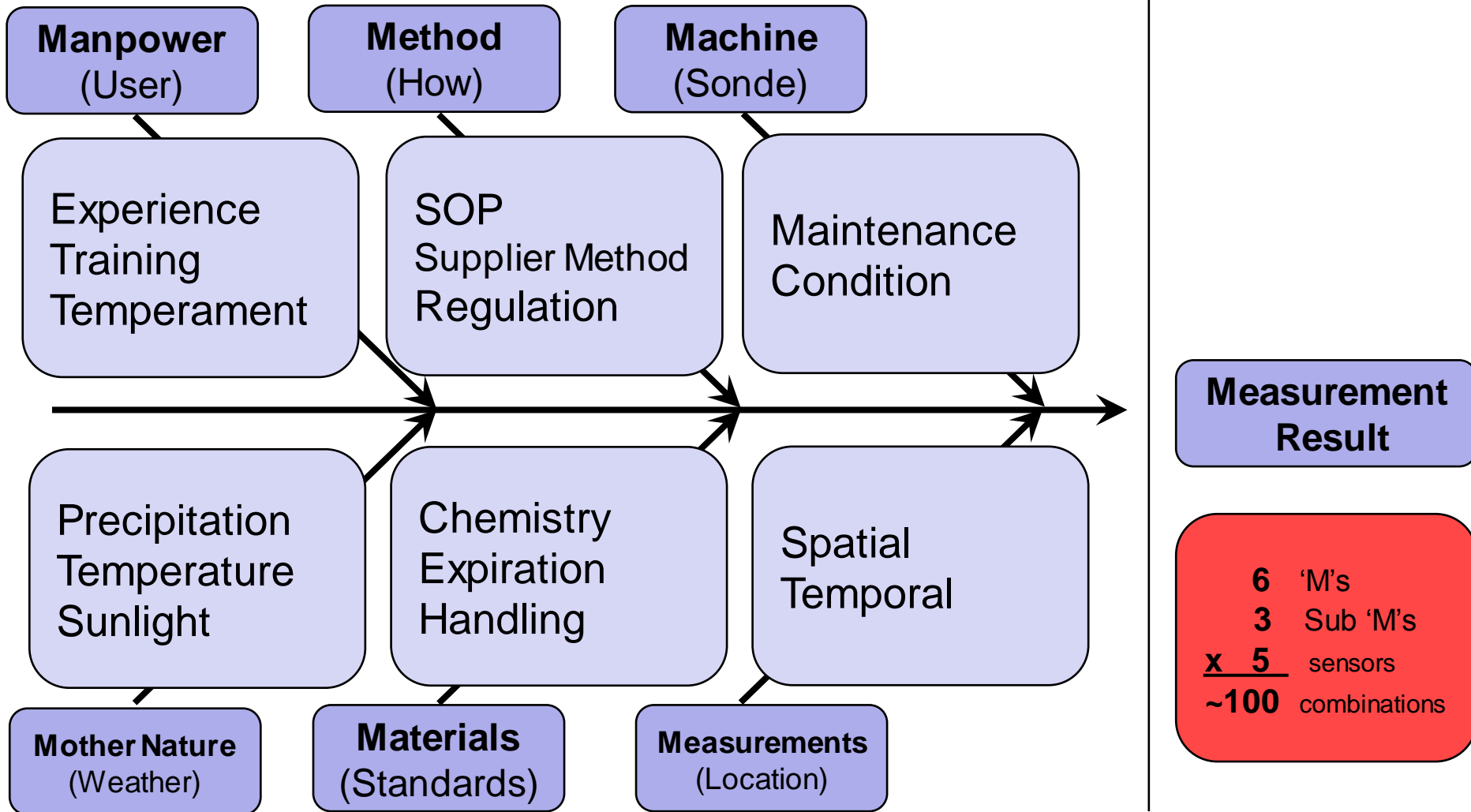




# Variability: Identify and Minimize

## Cause

## Effect



# Temperature



- Most straight forward
- Thermistor
- Beware...

# Sensor Dependencies

## This sensor...

Temperature

Conductivity

## ...is used with

Conductivity\*

x

DO (% Sat)

x

pH

x

x

*\* Its derivatives*

# Conductivity



- Cleanliness during calibration is critical
- Temperature compensation methods vary

# Sensor Dependencies

## This sensor...

Temperature

Conductivity

## ...is used with

Conductivity\*

x

DO (% Sat)

x

pH

x

x

*\* Its derivatives*

# Dissolved Oxygen (LDO)



- Calibrate in air saturated water
- Use the right BP
- Change cap yearly

- Two parts: measuring electrode and reference electrode
- Both degrade
- Rebuild reference as needed

pH  
glass  
bulb



# Turbidity



- Cleanliness during calibration is critical
- Use formazin or StablCal
- Change wiper blades



If sondes could talk...



# ***Data*** You Can **Trust**




- **Reliability**
- **Ease-of-Use**
- **Metadata**

Hydrolab Operating Software
File Edit Setup Help

Erik's HL4
Serial Number 9048200-4-29
65%
Webinar Example
USB
Devices

Overview
Monitoring
Logging
Calibration
Sensors
Settings

STATUS


**Good**

No issues have been detected

SENSORS

**Temperature**

**Conductivity**  
Calibrated 4/24/2014    Calibration expires in 80 days

**Hach LDO**  
Calibrated 4/24/2014    Calibration expires in 80 days

**pH**  
Calibrated 4/24/2014    Calibration expires in 80 days

**ORP**  
Calibrated 4/24/2014    Calibration expires in 80 days

Details...
Check Calibration...
Calibrate...

LOG FILES ON ERIK'S HL4

Logging in Progress  
Next measurement in 7 minutes

**Webinar Example**  
Start Date 5/4/2014 9:15 AM  
End Date 5/18/2014 9:15 AM  
Details...

Name	Start Date	End Date
Hydromet Service	11/12/2012 10:00 A	11/12/2012 10:14 PI
Log_20130827	8/27/2013 12:07 PM	8/27/2013 4:06 PM
Log_20130827s	8/27/2013 4:13 PM	8/27/2013 4:21 PM
Log_20130903	9/3/2013 2:00 PM	9/3/2013 2:58 PM
Log_20130909	9/9/2013 10:11 AM	9/10/2013 10:46 AM
Log_20130925_224852	9/25/2013 10:48 PM	9/29/2013 5:28 PM
Log_20131031_091915	10/31/2013 9:19 AM	11/1/2013 4:11 PM
prueba	1/24/2014 9:10 AM	1/24/2014 9:15 AM
Webinar Example	5/4/2014 9:15 AM	5/18/2014 9:15 AM


Transfer...

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Calibrated 4/24/2014      Calibration expires in 80 days

Details...
Check Calibration...
Calibrate...

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Transfer...

Hydrolab Operating Software File Edit Setup Help

Erik's HL4 Serial Number 9048200-4-29 70% prueba USB Devices

Overview Monitoring Logging Calibration Sensors Settings

HACH LDO CALIBRATION - DO %SAT Calibration

1 Save Calibration

Put the sensor in 100% air saturated water

DO

100.5  
%SAT

DO 7.38 mg/L  
Temperature 21.17 °C  
Salinity 0.01 psu  
Barometric Pressure 631.0 mmHg

Standard 100 %SAT

Cancel Back

Hydrolab Operating Software File Edit Setup Help

Erik's HL4 Serial Number 9048200-4-29 70% prueba USB Devices

Overview Monitoring Logging Calibration Sensors Settings

HACH LDO CALIBRATION - DO %SAT Calibration

1 Save Calibration

Stabilizing...

100.1  
%SAT

DO 7.24 mg/L  
Temperature 21.87 °C  
Salinity 0.01 psu  
Barometric Pressure 631.0 mmHg

Standard 100 %SAT

Cancel Back Next

MEASUREMENTS

Point	Standard (%SAT)	Measured (%SAT)
1	100	

INSTRUCTIONS

Put the sensor in 100% air saturated water

Accurate barometric pressure is necessary to calibrate with this method. If you did not enter the barometric pressure in the previous screen click Cancel. For calibration add about one liter of room temperature deionized water (or clean tap water with a conductivity of less than 500 uS/cm)

Close


Hydrolab Operating Software File Edit Setup Help

Erik's HL4 Serial Number 9048200-4-29 70% prueba USB Devices

Overview Monitoring Logging Calibration Sensors Settings

### HACH LDO CALIBRATION - DO %SAT Calibration

**1 Save Calibration**

 **Calibration Complete**

Calibration Interval  days

Next Calibration Date 6/3/2014 9:01:59 AM

User Name

Log Note

Cancel Back Save Calibration

**MEASUREMENTS**

Point	Standard (%SAT)	Measured (%SAT)
1	100	99.7

**INSTRUCTIONS**

**Put the sensor in 100% air saturated water**

Accurate barometric pressure is necessary to calibrate with this method. If you did not enter the barometric pressure in the previous screen click Cancel. For calibration add about one liter of room temperature deionized water (or clean tap water with a conductivity of less than 500 uS/cm)

Close



# Calibration History

Hydrolab Operating Software File Edit Setup Help

Erik's HL4 Serial Number 9048200-4-29 66% Webinar Example USB Devices

Calibration History

Date	Sensor	Serial Numbe	Event	Type	Standards	Results	Dia
9/25/2013 9:54 PM	Temperature	1209013793	Check		24 °C	23.1889 °C (3.38%)	Pas:
11/12/2013 10:48 AM	Temperature	1209013793	Check		23 °C	23.61218 °C (2.66%)	Pas:
11/26/2013 8:17 AM	Temperature	1209013793	Check		19.5 °C	19.09323 °C (2.09%)	Pas:
4/24/2014 2:10 PM	Conductivity	1210013836	Calibration	SpCond 2-point Calib	0, 1412 µS/cm	Slope 0.9595526, Intercep	Pas:
4/24/2014 2:11 PM	Conductivity	1210013836	Check		100 µS/cm	101.3747 µS/cm (1.37%)	Fail
8/16/2013 2:57 PM	Hach LDO	1306000473	Calibration	DO %SAT Calibration	100 %SAT	Scale 1.10383	Pas:
8/27/2013 8:31 AM	Hach LDO	1306000473	Check		0 %SAT	81.57484 %SAT (Infinity%)	Pas:
9/25/2013 9:56 PM	Hach LDO	1306000473	Check		100 %SAT	127.0561 %SAT (27.06%)	Pas:
9/29/2013 2:02 PM	Hach LDO	1306000473	Calibration	DO %SAT Calibration	100 %SAT	Scale 1.067814	Pas:
9/29/2013 6:16 PM	Hach LDO	1306000473	Calibration	DO %SAT Calibration	100 %SAT	Scale 1.001649	Pas:
9/29/2013 6:20 PM	Hach LDO	1306000473	Calibration	DO %SAT Calibration	100 %SAT	Scale 1.000088	Pas:
10/11/2013 2:40 PM	Hach LDO	1306000473	Check		0 %SAT	98.54411 %SAT (Infinity%)	Pas:
11/11/2013 3:45 PM	Hach LDO	1306000473	Check		100 %SAT	88.30187 %SAT (11.7%)	Pas:
11/12/2013 10:48 AM	Hach LDO	1306000473	Calibration	DO %SAT Calibration	100 %SAT	Scale 1.159747	Pas:
11/20/2013 4:05 PM	Hach LDO	1306000473	Check		100 %SAT	106.3328 %SAT (6.33%)	Pas:
11/20/2013 4:07 PM	Hach LDO	1306000473	Check		100 %SAT	106.2933 %SAT (6.29%)	Pas:
1/21/2014 2:18 PM	Hach LDO	1306000473	Calibration	DO %SAT Calibration	100 %SAT	Scale 1.102167	Pas:
1/21/2014 2:19 PM	Hach LDO	1306000473	Calibration	DO %SAT Calibration	100 %SAT	Scale 1.103924	Pas:
1/24/2014 9:11 AM	Hach LDO	1306000473	Calibration	DO %SAT Calibration	100 %SAT	Scale 1.10249	Pas:
3/12/2014 1:59 PM	Hach LDO	1306000473	Check		100 %SAT	128.6253 %SAT (28.63%)	Pas:
4/24/2014 2:13 PM	Hach LDO	1306000473	Calibration	DO %SAT Calibration	100 %SAT	Scale 1.121273	Pas:

Export...

OK Cancel

## ‘Data about the data’



- ✓ Date/Time
- ✓ User
- ✓ Location
- ✓ Settings
- ✓ Status
- ✓ Calibration/maintenance expiration
- ✓ Serial number and date of manufacture





[illegible]

An illustration of a grey filing cabinet with two drawers, the bottom one of which is open and contains a yellow folder. To the right of the cabinet is a computer system consisting of a CRT monitor on a silver stand and a vertical tower unit.

# Example of Log Files

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## The Hydrolab HL Series Tells Me:

- ☑ There is a problem and it is “X”
- ☑ Time to calibrate the sensor
- ☑ Maintenance is due
- ☑ What was done, when, by whom, and with what result



**Ultimately: you can trust your data!**

# Thank You

